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Effect of some physico-chemical factors on the survival and growth of *Penaeus monodon* postlarvae

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P. monodon postlarvae from the Hatchery or Wet Laboratory were stocked in experimental containers at 10 per liter of seawater. In most cases, 2- to 2.5-liter volumes were used per container. The experiments were done at least in duplicates. Feeding with minced mussel or tuna meat was done at the rate of 10 mg of feed per postlarva. Diatoms were occasionally added at 10×10^3 cells/mL. Growth rates were determined by measuring body weight.

Growth and survival rates were examined at different temperatures, salinities, and nitrite and ammonia concentrations, using one feed level. Condition of the postlarvae greatly affected the experimental results as shown in some instances where very low survival rates were obtained even for the controls.

Results indicated that postlarvae from P_{10} and up can tolerate salinity changes of 10 to 20 ppt without prior acclimation (Table 1). However, with acclimation, high survival was obtained at a salinity of as low as 3 ppt (Table 2). At room temperature, and with postlarvae pre-acclimated at 32 ppt, growth is significantly faster at lower salinities. Survival rates are similar at all levels indicating that postlarvae can withstand a wide range of salinity. Postlarvae from P_5 to P_9 were found to be less tolerant to salinity changes, and mass mortality was observed at 12 ppt even when salinity was gradually lowered.

Survival generally appears the same for temperatures between 24 and 36°C. It appears that *P. monodon* postlarvae have higher temperature tolerance.

Tolerance of postlarvae at the early postlarval stage is between 30 and 50 ppm of nitrite (Fig. 1). Postlarvae from P_{10} and up were found to be more tolerant, with the tolerance level at about 100 ppm. Although survival was high in runs containing nitrite, growth appears to have been affected.

Postlarvae can withstand ammonia concentration up to about 50 ppm; at 100 ppm higher mortality rates were observed (Fig. 2). At all ammonia levels examined, growth rate were essentially similar, based on the average weight of the postlarvae.

Only survival and growth rates were observed in this study. Whether or not there is any permanent effect by nitrite and ammonia at high but apparently tolerable levels is not known. It has been reported, however, that even at sublethal levels, these toxic metabolites have adverse effects on some aquatic animals. Among the effects are 1) increase in the susceptibility of the animals to other unfavorable conditions, 2) inhibition of normal growth, 3) decrease in fecundity, and 4) decrease in resistance to disease.

Table 1. Effect of salinity on the survival and growth of *P. monodon* postlarvae (P_{11} to P_{13}) with initial average weight of 2 mg., at water temperature of 24.8 to 29.0°C; pH range of 8.00 to 8.55; and nitrite concentration of 0 to 12 ppm.

Salinity range (ppt)	Average survival (%)	Average increase in body weight (%)
9-12	71	229.0
16-21	60	99.0
26-30	51	22.0
33-39	51	43.5

Table 2. Effect of temperature on the survival and growth of *P. monodon* postlarvae (P_{10} to P_{16}) at a salinity range of 30 to 35.5 ppt; pH range of 8.05 to 8.30; and nitrite concentration range of 0 to 0.37 ppm., with an acclimation period of 24 hr.

Temperature range (°C)	Mean temperature (°C)	Survival (%)	Increase in body weight (%)
24.0-26.9	25.8	64.0	32.5
30.1-32.6	31.1	49.5	37.5
33.3-36.9	34.8	42.0	28.3
34.0-37.7	35.6	24.0	20.0

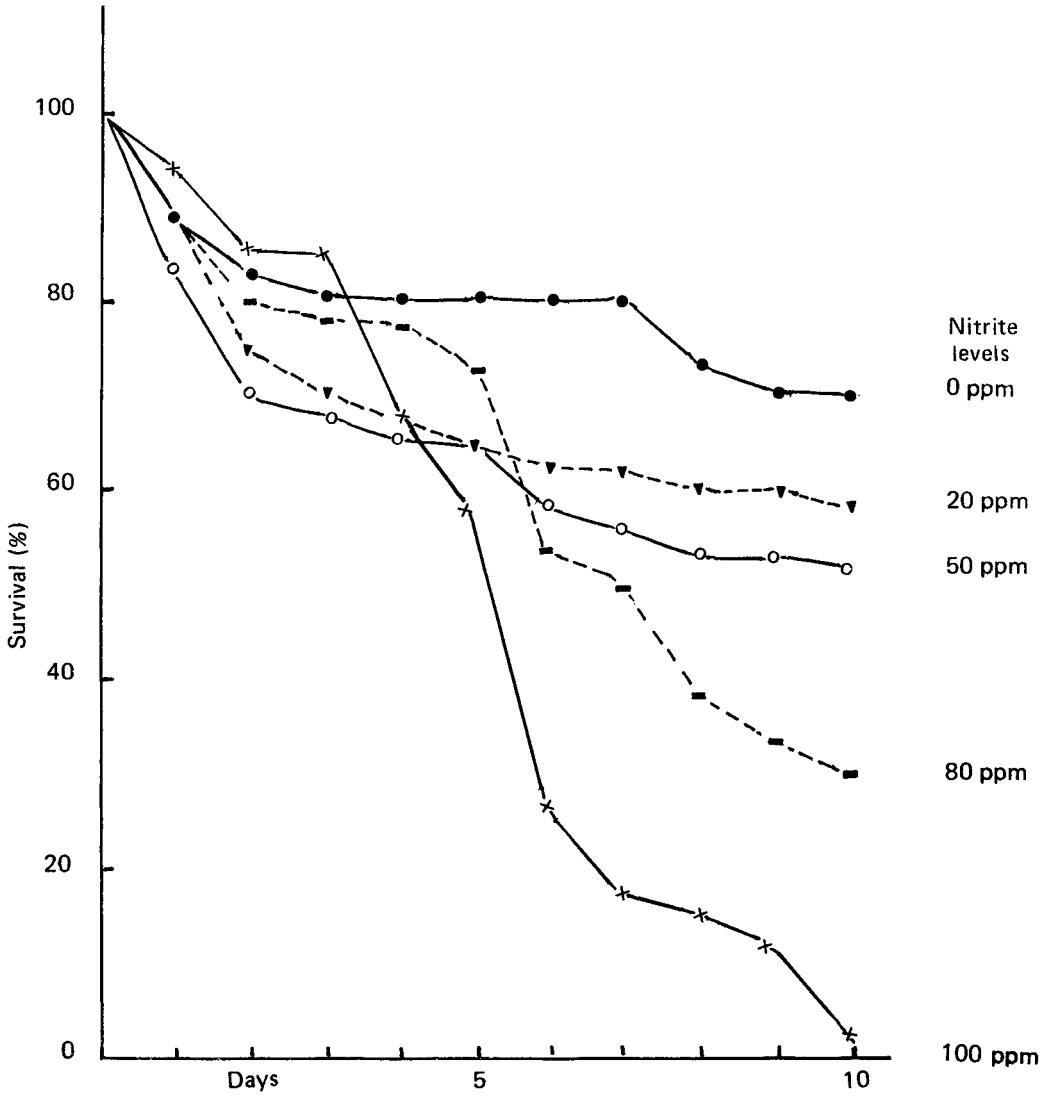

Fig. 1. Effect of nitrite on the survival of *P. monodon* postlarvae (P_3) at a salinity range of 26 to 28 ppt, pH range of 8.30 to 8.68, and temperature range of 26 to 28°C.

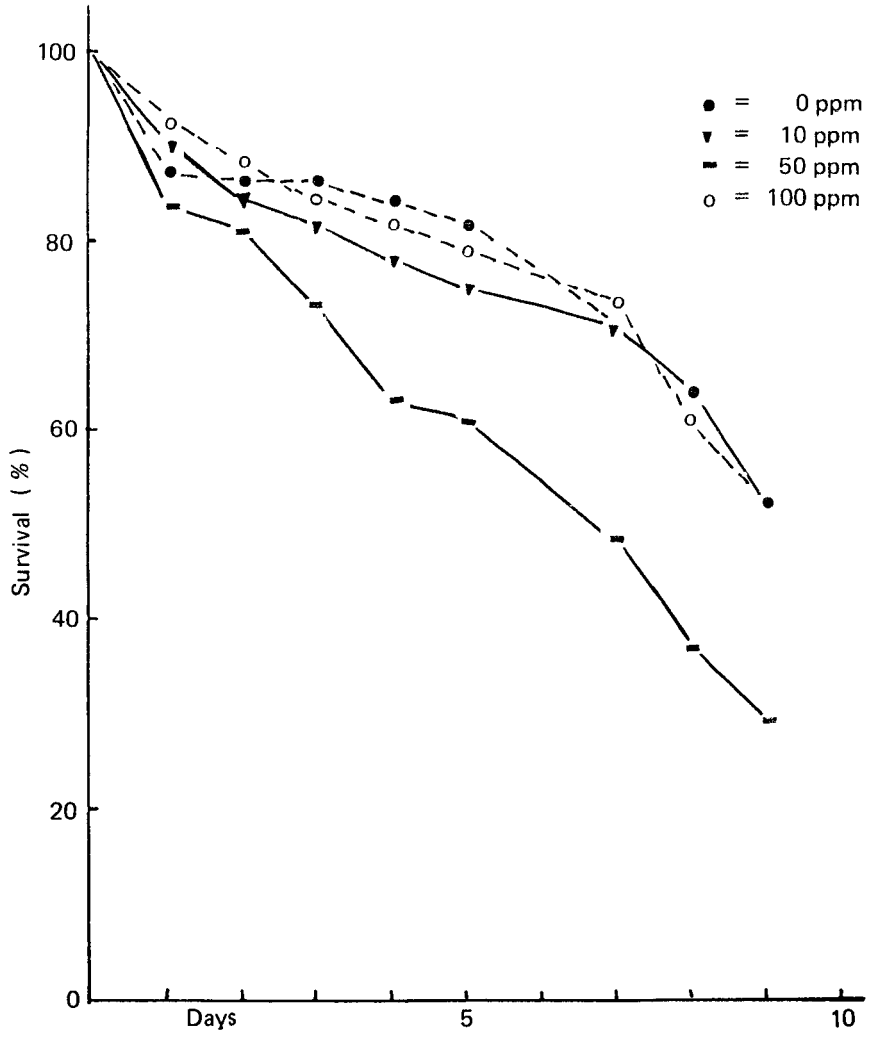

Fig. 2. Effect of ammonia on the survival of *P. monodon* postlarvae (P_2) – zoea to mysis, and zoea to postlarva, at nitrite range of 0 to 0.57 ppm, pH range of 7.95 to 8.48, and temperature range of 24.5 to 26.8°C. NH_4Cl was added to water in experimental containers prior to stocking of postlarvae.